

of the clypeus than it is in *A. geniculatus**, while in the latter species the chitinous disc bears a sharp transverse ridge on each side of the central peg.

In *Simulium austeni* the egg-burster is very small and inconspicuous, and appears to have no membranous area surrounding it, but this may not be the case throughout the genus. I hatched out in 1915 a number of young larvæ of *S. angustipes*, and, though these were not kept, my recollection of them is that they had egg-bursters as well developed as those of the Culicidæ. If this is so, it may be due to differences in breeding-habits between the two species.

The subject is one of considerable interest and will certainly bear further investigation.

XXXV.—*The Amphipod Orchestia tucurauna, Fritz Müller, of Brazil, redescribed from New Zealand Specimens.* By CHAS. CHILTON, M.A., D.Sc., LL.D., C.M.Z.S., Hon. Memb. Roy. Soc. N.S.W.

ON July 11th, 1910, I collected near the mouth of the Waitohi stream at Picton, New Zealand, several specimens of a sandhopper that I thought at the time would probably be *Orchestia chiliensis*, Milne-Edwards, which is common on the neighbouring shores of Queen Charlotte Sound and elsewhere on the New Zealand coasts. On examination, however, I found that, though two of the specimens were *O. chiliensis*, the others differed considerably from *O. chiliensis* in the shape of the second gnathopods of the male. One male specimen of these was dissected and mounted and to some extent examined, and was provisionally named *O. redmani*, sp. n., in my MS. in honour of Dr. Redman of Picton, to whom I am indebted for much assistance. I felt sure that I had seen somewhere a drawing of a gnathopod similar to the second gnathopod of this specimen, but at the time could not ascertain where this was; consequently the specimens were laid aside for a more favourable opportunity. Recently, in looking up Stebbing's paper in the Trans. Linn. Soc. vol. vii. p. 395, 1909, for another purpose, my attention was drawn to his figures of *O. sulenisoni* (pl. xxx. C), owing to the

* This character would appear to be variable, since the egg-burster is shown nearer the middle of the head in Scott-Macfie's figure than it appeared to be in the cast skins of the same species which I examined.

resemblance of the second gnathopod to that of my Picton specimens. A comparison of my specimens with Stebbing's description and figures of *O. sulenisoni* made it appear very probable that they belonged to the same species, though the palm of the second gnathopod of *O. sulenisoni* is shown considerably more oblique and that species was supposed to have been obtained at Madeira, the locality, however, being doubtful.

Stebbing states that his species agrees with the imperfectly described *O. tucurauna*, Fritz Müller, in regard to the finger and the notched palm of the second gnathopods, but appears to differ in not having the fourth and fifth joints of the fifth peræopod thickened or broadened. In turning up Fritz Müller's reference to his specimen in 'Facts and Arguments for Darwin,' 1869, p. 79, I find that the second gnathopod of the male, as figured by Fritz Müller, agrees pretty closely with that of the Picton specimens, and that, moreover, the description given by Fritz Müller of the changes that take place in the males even after they attain sexual maturity and his account of the more immature males agree very well indeed with those exhibited by the Picton specimens. Thus I had already noted that in them the first few joints of the flagellum of the second antenna were more or less completely fused in the fully developed males and that in the young males the process on the finger and the corresponding notch on the palm of the second gnathopod were only slightly developed. There seems little doubt that the specimen described by Stebbing as *O. sulenisoni* is really the same as Müller's *O. tucurauna*. Stebbing's description of the various characters not mentioned by Fritz Müller agrees closely with the Picton specimens; thus, while the basal joint is oval in the third and fourth peræopods and partially so in the fifth, its hind margin in that limb is almost quite straight as described by Stebbing. In my specimens, in the better developed males the second antennæ are strong and have the last two joints of the peduncle considerably broadened, but in none of my specimens have I seen the fourth and fifth joints of the fifth peræopod specially broadened; they are comparatively slender, as drawn and described by Stebbing. I have little doubt, however, that Fritz Müller is right in saying that this character is shown only in the older males and is not fully developed until after they come to sexual maturity. I have often noticed the same thing in the nearly allied species *O. chiliensis*, M.-Edw., where the males may have the characteristic form of the second gnathopod and of the antennæ, though they have not yet developed the thickened

joints of the fourth and fifth pereopods, this latter character being found in comparatively few individuals.

Consequently from a comparison of my specimens with the two descriptions as given by Müller and Stebbing I feel little doubt that they are sufficiently near to be considered as belonging to the same species, notwithstanding the widely separated localities from which they were obtained. Fritz Müller does not mention the locality from which he collected his species, but presumably it was obtained while he was living in South Brazil either at Blumenau or at Desterro. My Picton specimens were obtained on the banks of the Waitohi stream at some little distance from its mouth in a place that would not be affected by ordinary high tides, though it would be reached by unusually high tides. At the same time and place I collected specimens of *Porcellio scaber*, several beetles, spiders, &c.—animals not by any means confined to the sea-shore. I have never seen the species from any other part of New Zealand. Fritz Müller gives no particulars as to the conditions under which the specimens were collected, and the locality of the single specimen of *O. sulensoni* in the Copenhagen Museum described by Stebbing is uncertain, though it is supposed to have come from Madeira.

I am inclined to think that the single specimen from Kapiti Island described by Filhol as *Orchestia dentata* (1885, p. 462, pl. liii. fig. 1) belongs to *O. tucurauna*, but neither his description nor his figure is sufficient to make the identification certain*.

The occurrence of *Orchestia tucurauna* both in South America and in New Zealand is interesting as another example of the connection between the two faunas; *O. chiliensis*, M.-Edw., which was found at Picton along with

* A few days after the MS. containing the statement above was posted I found a tube containing some Amphipods collected in 1906 by Dr. Cockayne at Kapiti Island "on rocks at base of a waterfall." Of the three specimens in the tube (the existence of which I had previously forgotten), one is a well-developed male of *O. tucurauna* agreeing well with the Picton specimens, the lower antenna being quite stout and the fifth pereopods, though not showing any definite broadening, hardly as narrow as the Picton specimens. There can be little doubt, therefore, that *O. dentata*, Filhol, from Kapiti Island, is really the same as *O. tucurauna*, as I had suggested. Of the other two specimens, one is *Parorchestia sylvicola* (Dana), the land-hopper found all over New Zealand, often far from the sea, and the other is an imperfect specimen of *Orchestia chiliensis*, M.-Edw.

It may be noted that both the Picton and the Kapiti Island specimens were obtained where the water was probably brackish or even fresh at the time; and I suspect that *O. tucurauna* will be found to be more or less confined to such localities.

O. tucurauna and is common on all New Zealand coasts, also occurs on the coasts of Chile, and, as I have pointed out elsewhere, numerous other Crustacea have a similar distribution—for example, the shore Isopod, *Deto bucculenta* (Nicolet), which is found in New Zealand (including the outlying Chatham Islands) and in Chile, South America (see Chilton, 1909 A, p. 602, 1909 B, p. 799, and 1915, p. 453).

I give below a specific diagnosis, with figures of the species *O. tucurauna*, and a few additional notes on its structure.

I wish to express my grateful thanks to my assistant, Miss E. M. Herriott, M.A., for the care she has taken in preparing the drawings for this paper.

Orchestia tucurauna, Fritz Müller. (Text-figs. 1-14.)

O. tucurauna (also printed *O. tucuratinga*), Fritz Müller, 1864, 'Für Darwin,' p. 54, figs. 50 & 51, and 1869, 'Facts and Arguments for Darwin,' p. 79, figs. 50 & 51.

O. tucurauna, Stebbing, 1906, p. 534.

O. sulenoni, Stebbing, 1899, p. 400, pl. xxx. c, and 1906, p. 541.

O. redmani, sp. n., Chilton, MS.

? *O. dentata*, Filhol, 1885, p. 462, pl. liii. fig. 1.

Specific Diagnosis.

Male.—Side-plates not deep, anterior lobe of side-plate of peræopod 3 much deeper than the posterior lobe. Pleon-segment 3 with postero-lateral angles quadrate, acute, scarcely produced, posterior margin with a few short setæ. Eyes of moderate size, round. Antenna 1 not reaching to end of penultimate joint of antenna 2, first joint as broad as long, second and third each a little longer than the preceding; flagellum of four to six joints, the first three being coalesced, subequal in length to the peduncle. Antenna 2 stout, last joint of peduncle longer and slightly more slender than the penultimate; flagellum subequal in length to the peduncle and of about twenty joints, the first four or five more or less completely coalesced, especially in old males. Gnathopod 1 with side-plate small, somewhat triangular, slightly produced anteriorly, its inferior margin bearing a few small setæ; basal joint narrow at base, widening distally, its anterior surface grooved; ischium without apical process; carpus with prominent, narrowly rounded, distal pellucid process; propod oblong, widening to the palm, and bearing distally a rounded pellucid process, palm not distinctly defined and overlapped by finger; all the joints beset with numerous short setæ. Gnathopod 2, basal joint narrow at the base, not broadening greatly distally, anterior surface grooved; carpus

very small, triangular; propod very large, broadly oval, widening slightly to the palm, both margins almost free from setæ, the hind one with a few small setæ towards distal end,

Fig. 1.

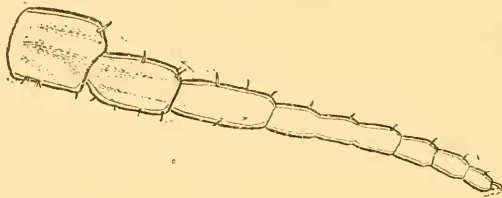
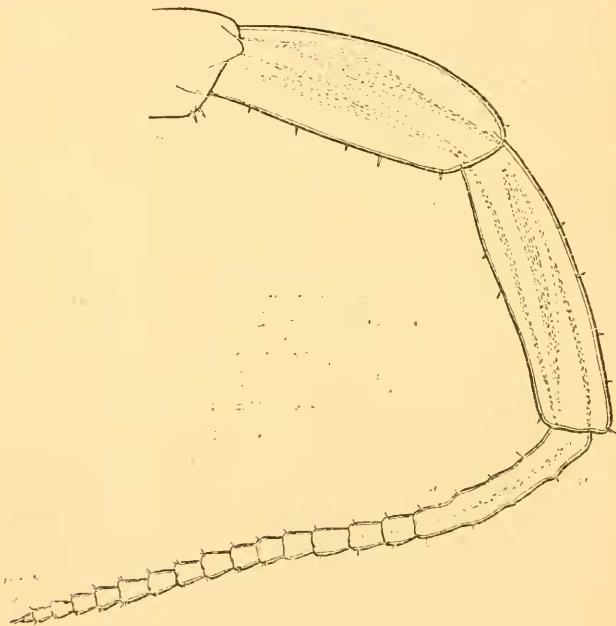


Fig. 2.

Fig. 1.—*Orchestia tucurana*, first antenna of male.Fig. 2.—*Orchestia tucurana*, second antenna of male.

palm nearly transverse in old males, more oblique in younger individuals, spinulose, irregularly convex between the blunt defining tooth and a deep depression near the hinge; dactyl

Fig. 3.

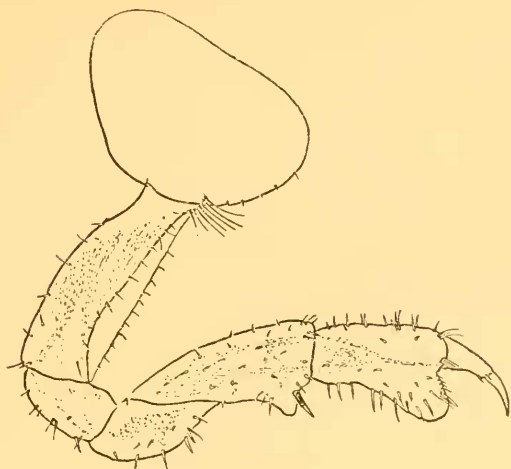


Fig. 4

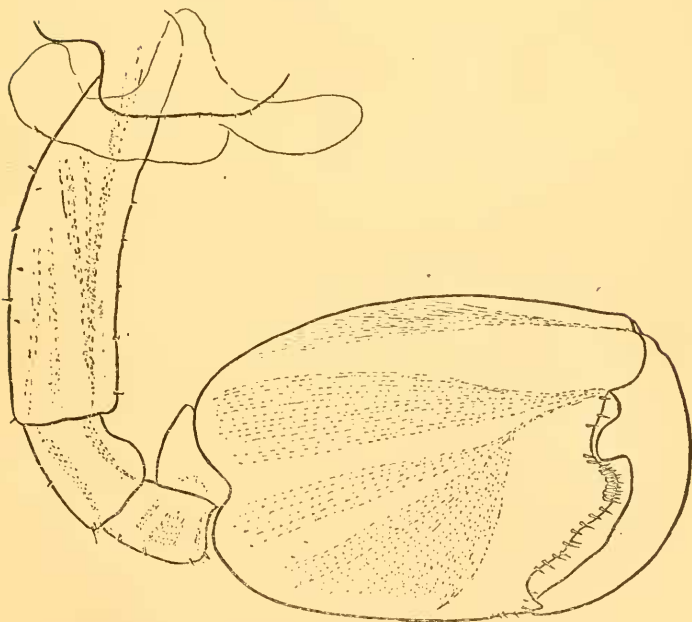


Fig. 3.—*Orchestia tucurauna*, first gnathopod of male.
Fig. 4.—*Orchestia tucurauna*, second gnathopod of male.

Fig. 5.

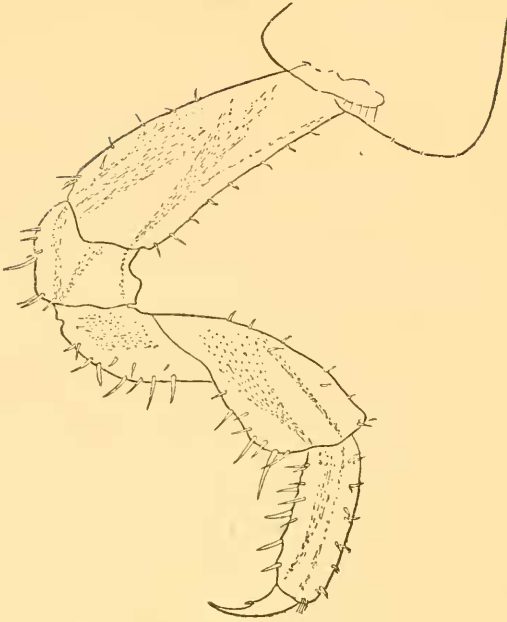


Fig. 6.

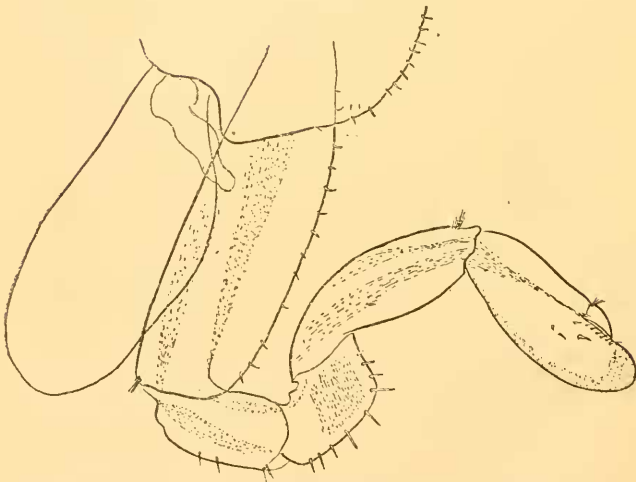
Fig. 5.—*Orchestia tucurauna*, first gnathopod of female.Fig. 6.—*Orchestia tucurauna*, second gnathopod of female.

Fig. 7.

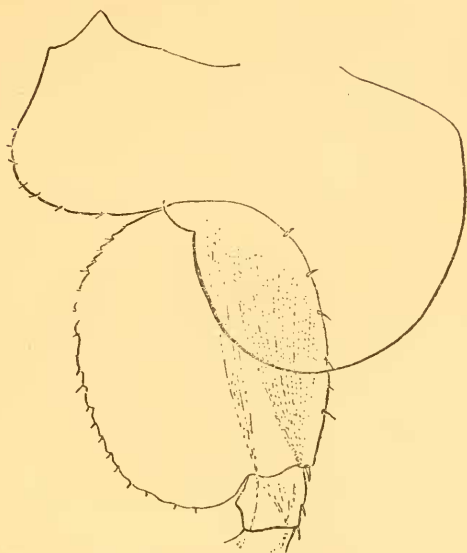


Fig. 8.

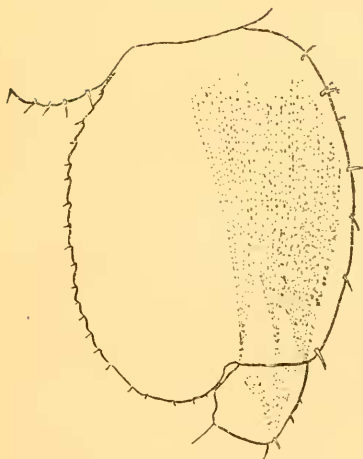


Fig. 9.

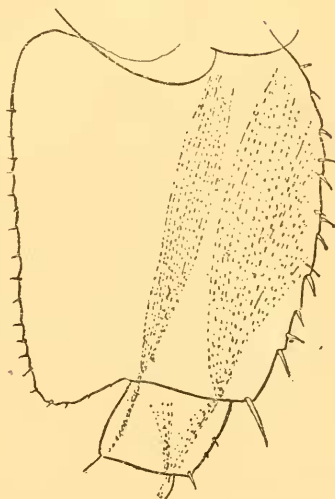


Fig. 7.—*Orchestia tucurauna*, side-plate and basal joint of peraeopod 3 of male.

Fig. 8.—*Orchestia tucurauna*, basal joint of peraeopod 4 of male.

Fig. 9.—*Orchestia tucurauna*, basal joint of peraeopod 5 of male.

large, strongly curved, its inner margin bearing a prominent convex process near the base, fitting into the depression in the palm. Peræopod 1 slightly longer than the second, which has the finger indented. Peræopods 3 and 4 with basal joint oval, larger and slightly narrower in the fourth

Fig. 10.

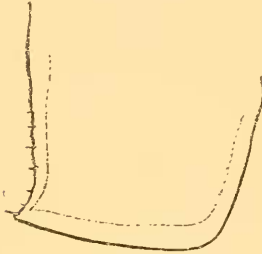


Fig. 12.

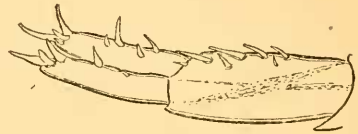


Fig. 11.



Fig. 13.



Fig. 14.



- Fig. 10.—*Orchestia tucurauna*, inferior portion of third pleon-segment.
 Fig. 11.—*Orchestia tucurauna*, first uropod.
 Fig. 12.—*Orchestia tucurauna*, second uropod.
 Fig. 13.—*Orchestia tucurauna*, third uropod.
 Fig. 14.—*Orchestia tucurauna*, telson.

than in the third; basal joint of fifth with hind margin almost straight, posterior angle somewhat produced downwards; posterior margin in all serrate and with fine spinules; remaining joints in all rather slender in specimens examined,

but those of the fifth said to become broader in old males (Fritz Müller). Uropod 1 with peduncle scarcely longer than rami, its upper margin bearing numerous spines, both rami with lateral as well as terminal spines. Uropod 2 with rami about as long as peduncle, both with lateral and terminal spines. Uropod 3 with ramus about as long as peduncle, with spines on margin and at apex. Telson with posterior margin rounded and fringed with numerous spines, very slightly indented in middle.

Female.—First gnathopod with side-plate small, triangular produced in front, carpus longer and slightly broader than the propod, which narrows distally, so that the joint is simple, without palm. Second gnathopod with basis of nearly same width throughout, broadened, but not greatly so; carpus and propod subequal, long-oval, posterior margin of carpus moderately and regularly convex. Peræopods as in male, but with the joints a little more slender. In other respects closely resembling the male.

Length of largest male examined about 14 mm.

Locality. Banks of Waitohi stream, Picton, at some distance from mouth; Rapiti Island (*Filhol*) (?).

Distribution. New Zealand, South Brazil, Madeira (?).

Remarks.

The mouth-parts are of the type usual in *Orchestia*, and do not call for detailed description. The palp on the first maxilla is minute, but distinct. In the largest male examined there appears to be an obscure rudiment of the fourth joint of the palp of the maxilliped, but I can find no sign of it in two other specimens mounted, viz., a male less developed and a female.

The New Zealand specimens appear to differ from Stebbing's description of the single specimen of *O. sulenisoni* in having the first antenna slightly longer, the flagellum having more than four joints. In the first gnathopod the rounded lobe at the distal end is more distinct and in the second the palm is more transverse; both these differences are probably due to the fact that the type-specimen of *O. sulenisoni* was hardly so mature as the Picton specimens. In the third uropod the ramus is as long as the peduncle; Stebbing describes it as "not half as long or half as broad."

Fritz Müller's account deals only with a few special points. His figure of the second gnathopod of the male does not show the tooth defining the palm, but the strongly marked convex

process on the base of the finger and the corresponding depression in the palm are quite the same as in the New Zealand specimens and are very distinctive of the species. His figure of the second gnathopod of the female shows the limb shorter and stouter and the basal joint much broader than in my specimens. As already mentioned, he states that in old males the joints of the fifth peræopod become broadened; this is not shown in any of my specimens nor in the type of *O. sulensoni*.

I do not consider these differences in the descriptions and figures sufficient to counterbalance the close resemblance in the distinctive character of the second gnathopod of the male, supported as it is by Müller's account of the coalescence of the basal joints of the flagellum of the second antenna and by the resemblances in other characters to those given by Stebbing for *O. sulensoni*.

Orchestia tucurauna appears to belong to that section of the genus containing *O. chiliensis*, M.-Edw., *O. miranda*, Chilton, and *O. platensis*, Krøyer, in which there is a tendency in the males for the second antenna to become stout and for some of the joints of the fifth peræopod to be broadened. *O. pickeringii*, Dana, should perhaps also be grouped in the same section.

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